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GEOPHYSICAL VARIABLES AND BEHAVIOR: LXI. UFO REPORTS IN CARMAN MANITOBA AND THE 1975 MINNESOTA QUAKE: EVIDENCE OF TRIGGERING BY INCREASED VOLUME OF THE RED RIVER [1]

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Summary.—The tectonic strain theory states that most UFO reports are related to luminous phenomena which are generated by the same stresses that produce earthquakes. Analyses of the epidemic-like profile of UFO reports within southern Manitoba during 1975 indicates that they were coupled to an unusually strong Minnesota earthquake. The quake occurred near the source of the Red River that flows into Manitoba. As hypothesized, (1) UFORs within the three neighboring states (ND, SD and MN) also increased dramatically during 1975, (2) there was a positive correlation between annual seismic energy release within these states and the numbers of UFORs, and (3) the numbers of UFORs within central southern Manitoba were strongly, positively correlated with the monthly volume of the Red River within this province, especially during 1975.

The tectonic strain theory states that natural luminous phenomena are responsible for most of the contemporary references to UFOs and strange luminosities. These phenomena have been hypothesized to be generated by the same increases in crustal stress and strain that produce earthquakes (Derr & Persinger, 1986, 1989, 1990; Persinger & Derr, 1985a, 1985b). Consequently, (1) there should be positive correlations within geological regions over time between the numbers of these reports and seismic energy release (an index of stress) and (2) any factor that affects local strain, such as varying loads on river systems, could trigger luminous phenomena and consequently UFO reports (UFORs).

The epidemic-like occurrence of UFORs within the Carman, Manitoba area during the year 1975 has been hypothesized to have been associated with the tectonic processes that preceded and followed the unusually large earthquake for the region that year (Persinger & Derr, 1985a). The epicenter for this event occurred near the origin of the Red River at the interface of the three states ND, SD, and MN. Because the Red River continues through southern Manitoba, extension of stress fields associated with the July 9 earthquake ($m_b = 5.0$) could have penetrated into this province. If the theory is applicable for that episode, then (1) UFORs within MN, ND, and SD should have increased as well during 1975, (2) UFORs within Manitoba,

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ND, SD, and MN should parallel an increase in the release of seismic energy, and (c) variations of load on the Red River System near Carman should have been associated with the numbers of UFORs within southern Manitoba.

To test these three hypotheses, monthly and yearly totals of UFORs, seismic energy release and indices of volume for the Red River at Emerson (border between Manitoba and ND-MN) and St. Agathe (near Winnipeg), Manitoba were obtained for the years between 1964 and 1979; this 14-yr. interval was selected because it includes the majority ($n = 411$ reports) of Rutkowski's (1983) initial data. A total of 659 UFORs for ND, SD, and MN were obtained from the Center for UFO Studies (CUFOS) file (Saunders, 1978); because only about 40% of the cases contained information on latitude and longitude, these data were supplied by assessing atlases. Redundant cases, defined as more than one entry for an event that occurred the same day in the same location, were deleted. Epicenters, magnitudes, and temporal information for earthquakes during this period were obtained from the U.S. Geological Survey Hypocenter Data File (HDF). Discharge measures (in m^3 for the Red River were determined from the Environment Canada's Manitoba Historical Stream Flow Survey (1983).

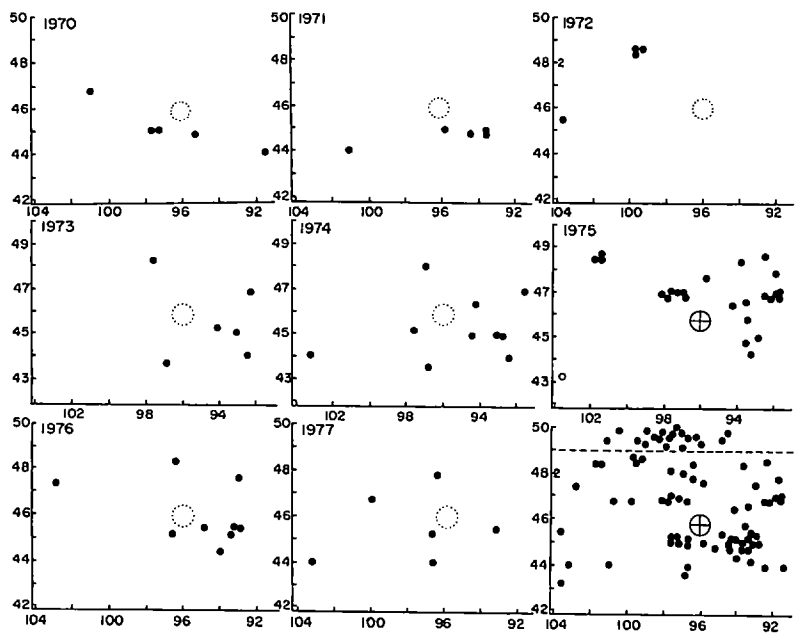

FIG. 1. Locations of UFO reports (UFORs) around the site of the epicenter (dotted circle) for the years before and after the strong Minnesota earthquake of 1975 (circle with +). The final panel displays all UFORs during this period, including those within southern Manitoba.

The spatial distribution of UFORs within the three states surrounding the 1975 epicenter for the years 1970 through 1977 are shown in Fig. 1. The conspicuous increase in the numbers of different locations (many of which contained multiple episodes during the year) for UFORs during 1975 is evident. Chi-squared analyses, using the mean numbers of different locations for UFORs during the 8-yr. series as the expected value per year, indicated a statistically significant ($p < .001$) deviation from chance expectancy for both the numbers of different locations of UFORs ($\chi_7^2 = 37.4$) and the total numbers of UFORs ($\chi^2 = 73.0$). These results support the first hypothesis that the 1975 Carman episode should have been associated with an increase in comparable reports in areas adjacent to Manitoba and surrounding the epicenter.

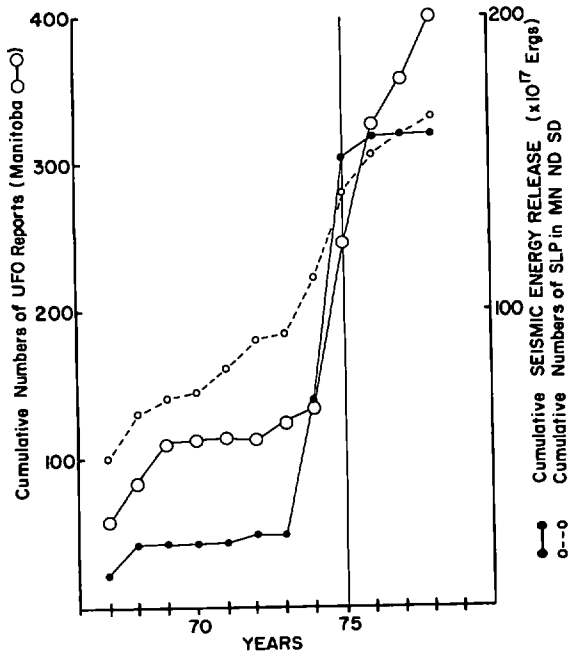

FIG. 2. Cumulative numbers of UFORs within southern Manitoba (large open circles), classic UFORs that share the greatest similarity to seismically related spherical luminosities within the adjacent three states, and the amount of seismic energy released within this region for the years 1967 through 1978

Fig. 2 displays (1) the cumulative numbers of UFORs within ND, SD, and MN, (2) the cumulative numbers of UFORs within Manitoba, and (3) cumulative seismic energy release (in ergs) within the entire region. That comparable changes in the rate of both UFORs and the release of seismic

energy (in ergs) occurred within this area during this period is evident. Lag-lead analyses of 0—3 yr. were also completed by SPSS^X software (VAX) between the numbers of UFORs per year in the three states and Manitoba and the energy release per year. Both Pearson r and Spearman *rho* coefficients were calculated. The latter was included because all of these measures were temporally skewed, and we wished to see if any comparison of magnitudes for the three types of measures (UFOR, river discharge, and energy release) remained stable within a conservative rank-ordering.

Numbers of UFORs within the three states were significantly correlated ($rho = 0.68$, $r = 0.50$, $p < .01$) with the amount of energy released per year within that region; however, the numbers of UFORs within southern Manitoba were not correlated systematically ($r = 0.85$, $p < .01$; $rho = 0.35$, $.1 < p < .05$) with the annual energy release per year within the three states. The discrepancy between the *rho* and r coefficients for Manitoba was due primarily to the year 1975 during which time the energy released by the Minnesota earthquake and the unprecedented numbers of UFORs occurred. These results support the hypothesis that stress fields preceding the intense July earthquake extended into southern Manitoba and were responsible for the UFORs that are contained within the Rutkowski collection (Persinger & Derr, 1985a).

To assess whether increased volume of the Red River was associated with an increase in numbers of UFORs within southern Manitoba, the mean monthly flow values at Emerson and St. Agathe were correlated with the numbers of UFORs per month during the 30 months of the major episode reported by Rutkowski (1983). Lag values for one to three months before each month were determined for the UFOR and river measures. Correlation analysis demonstrated a significant positive relationship between river flow the month before ($rho = 0.64$, $r = 0.63$, $p < .001$), the month of ($rho = 0.62$, $r = 0.58$, $p < .001$) and the month after ($rho = 0.59$, $r = 0.45$, $p < .01$) the numbers of UFORs. Lag/lead correlations greater than ± 1 mo.) were not statistically significant ($p > .05$). During May and July of 1975 both the river load and the numbers of UFORs were more than 2.5 standard deviations above the mean for the 30-mo. period.

Both Spearman ($rho = 0.93$) and Pearson ($r = 0.62$) analyses for the 12 months of 1975, the year of the energy release, demonstrated a strong positive relationship between the load on the river system and the numbers of UFORs within southern Manitoba. The magnitude of the relationship between UFORs and river measures at St. Agathe was comparable. Such changes in volume measures of the Red River are relatively rapid and intense; for example, within the 2-mo. period from March through May 1975, the mean monthly values increased from 47 m^3/sec. to 773 m^3/sec. These results support the third hypothesis: when a region's tectonic stress is

approaching seismic release, local factors such as increased loads on river systems can be associated with the occurrence of luminous phenomena and UFORs.

The tectonic strain theory is supported by both (1) the spatial proximity to and temporal contiguity between the Rutkowski's (1983) UFOR data for southern Manitoba and the CUFOS data for the adjacent states and (2) the release of energy associated with the unusually strong earthquake of July 1975. If the distribution of the southern Manitoba reports from the last panel of Fig. 1 is added to the location of UFORs within ND, SD, and MN, an hemisphere of the spatial distribution of reports around the epicenter is evident. Similar patterns have been noted for events in the Uinta Basin, Utah (Persinger & Derr, 1985b), Zeitoun, Egypt (Derr & Persinger, 1989), New Madrid, Missouri (Persinger, 1989), and Yakima, Washington (Derr & Persinger, 1986).

The movement of a "strain field" is the hypothetical process by which luminous phenomena (that are in turn reported as UFOs) are generated. During the three years before the 1975 quake, the distance of UFORs from the imminent epicenter decreased ($rho = -0.42$, $p < .05$); the distance of UFORs from the epicenter during the comparable period after the quake, showed no significant correlation ($rho = 0.10$, $p > .05$). In addition, during the 6 mo. before the July seismic event, the 11 UFORs within the three states were distributed in a NE-SW plane ($r = 0.85$, $p < .001$ when plotted by latitude and longitude) that passed through the epicenter. During the six months after the quake, the 17 UFORs within the three states were distributed in a more scattered NW-W by SE-E direction that passed near the epicenter ($r = -0.48$, $p = .05$).

Although these geometries could reflect some intrinsic feature of a strain field, other processes could be involved. However, the extent and consistency of these spatial and temporal patterns suggest that application of the tectonic strain theory to systematic and serious collection of human reports concerning luminous phenomena might help in the prediction of where and when increases in the release of seismic energy will occur.

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